

**FEDERAL AID
ANNUAL RESEARCH PERFORMANCE REPORT**

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

PROJECT TITLE: Evaluation and testing of techniques for ungulate management

PRINCIPAL INVESTIGATOR: Thomas Lohuis

COOPERATORS: Kenai National Wildlife Refuge; Chugach National Forest, Cordova District; University of Wyoming Department of Animal Science.

FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NR.: W-33-2

PROJECT NR.: 1.56

WORK LOCATION: Kenai Moose Research Center, Soldotna

STATE: Alaska

PERIOD: 1 July 2003–30 June 2004

I. PROGRESS ON PROJECT OBJECTIVES SINCE PROJECT INCEPTION

OBJECTIVE 1: MRC Operations: To conduct research support activities and duties associated with maintaining and operating the Kenai Moose Research Center, and caring for the captive animal population at the MRC.

Maintenance and operations activities of the Moose Research Center were conducted to facilitate research activities. Those activities include animal care as well as maintenance of roads, buildings, and fences.

OBJECTIVE 2: Drug Testing. Goals: Evaluation of new immobilizing drugs and/or drug combinations used in the capture of moose and caribou.

No new immobilizing drugs have been tested.

OBJECTIVE 3: Reproductive Indices. Goals: Evaluation of new techniques and equipment for monitoring reproductive status or reproductive events in moose and caribou.

Three years of data have been collected regarding the effectiveness of the Heatwatch System for detecting breeding events in caribou. It appears to be an effective system, and certainly is superior to visually confirming mating events.

Edited Oct-04

Please note: This is a progress report and the information contained within may be further analyzed and refined.

OBJECTIVE 4: Nutritional Condition Indices. Goals: Identify indices of body composition as well as energy and protein balance in moose and caribou.

4a. Leptin: We compiled approximately 400 moose serum samples for leptin assay from statewide populations in which blood and ultrasonic rump fat measurement were collected. Statewide moose populations (and corresponding collaborators) included Denali Park (Layne Adams), Copper River Delta (Dan Logan), McGrath Area (Rod Boertje and Mark Keech), Togiak National Wildlife Refuge (Andy Aderman), Tanana River (Rod Boertje and Mark Keech), Noatak National Park and Preserve (Brad Schulz), Nelchina Basin (Ward Testa), Yakutat Foreland (Matt Moran), and the MRC. Dr. Duane Keisler (University of Missouri) completed the leptin assays in April and we have begun analysis of the data to assess the relationship between serum leptin concentration and percent body fat.

4b: Purine derivatives: No work was performed on this objective during the current reporting period.

OBJECTIVE 5: Miscellaneous Projects. Goals: Generate and evaluate new or innovative techniques that may be applicable to ungulate management.

In order to facilitate ultrasound training and instruction, we upgraded our portable ultrasound with an external LCD screen and image storing capability (Smart Card).

OBJECTIVE 6: Moose Digestion, Reproduction, and Physiology. Goals: To assess moose browse nutritional quality, browsing behavior, foraging ecology, and to relate physiology and reproductive performance.

Recent development of assays for fecal glucocorticoid (GC) metabolites has provided a non-invasive means to assess a variety of human-induced disturbances and environmental conditions of free-ranging animals. Fecal samples are easy to collect year-round and provide an integrated reflection of all GC secretion over the previous 1-2 days. However, species-specific differences in steroid metabolism necessitate validation of the assay used to quantify GC secretion. A pharmacological challenge with adrenocorticotrophic hormone (ACTH) can establish whether fecal assays accurately reflect acute adrenal activation. In vertebrates, ACTH administration mimics a natural adrenal stress response by causing a rapid rise in GC circulation followed by a return to baseline within a few hours. The same pattern should occur in feces, with the onset of the peak excretion delayed by a species-specific lag time. A previous attempt to determine high cross-reactivity of the ICN [125 I] antibody to the major GC metabolites of moose proved inconclusive. In that case, we administered 1 IU/kg of ACTH to an adult male and adult female moose. A significant increase in GC metabolite excretion occurred at about 22 hours in the bull, but levels in the cow remain unchanged. We repeated the challenge with the cow, this time increasing the ACTH dose to 3 IU/kg, and detected a significant increase in GC metabolite excretion at about 24 hours. The delay of 22-24 hours for the onset of peak GC excretion in moose was similar to that found for other large ungulates. In addition, accuracy and parallelism tests indicated that interference from other substances in the feces was negligible and that the antibody binds with serially diluted GC metabolites in a dose-dependent manner. We conclude there is enough evidence to demonstrate the assay is suitable for use in moose.

We collaborated with Dr. Ansgar Aschfalk, Norwegian Veterinary Institute, in the assessment of the response of moose to *Salmonella* infection. We did this by injecting captive animals at the MRC with a *Salmonella* vaccine and sampling blood prior to and after the injection to detect any increase in antibodies. The results of the trials will be used to assess the exposure of wild moose populations, primarily in Scandinavia, to *Salmonella* through exposure to domesticated livestock, particularly reindeer. Dr. Aschfalk is currently analyzing those data.

We recently conducted research to correlate activity measures made via radio collar tip-switch to actual observations of moose activity. These observations and validations will be critical in our future efforts to associate habitat quality, moose browsing behavior, foraging ecology, and foraging effort.

In collaboration with Neil Barten (ADF&G region I) and Matt Moran (USFS Chugach NF), we continued to evaluate seasonal changes in moose body condition and the effect of nutritional condition on reproductive performance and survival. 10 adult bull moose were captured, sampled, and radio collared in the vicinity of Yakutat AK in Fall 2003, while 8 and 15 cow moose were captured, sampled, and radiocollared near Gustavus in Fall 2003 and Spring 2004 respectively.

We collaborated with Dr. Dan Rule (University of Wyoming Department of Animal Science) and Dr. Grant Hilderbrand and Howard Golden (ADF&G, Region II) to develop a baseline data set of fatty acid signatures from moose, caribou, and wolf tissue. Fatty acid signatures can potentially be used as indicators of the prevalence of ungulates in predator diets.

OBJECTIVE 7: Caribou Digestion, Reproduction, and Physiology. Goals: To assess caribou browse nutritional quality, browsing behavior, foraging ecology, and to relate physiology and reproductive performance.

Heatwatch transmitters were affixed to 6 adult female caribou during routine vaccination procedures in early September. Breeding events of 5 cows were detected by the Heatwatch system on October 8, 9, 9, 11, and 12. One transmitter fell off and no breeding event was detected or subsequently observed. Three of the five cows gave birth to live calves on May 24, 25, and 26. One cow (breeding event detected on October 8) died on May 9 from complications associated with pregnancy, a second cow (breeding event detected on October 12) did not give birth, and a third cow (the case where the transmitter fell off) did not give birth. The 228 day mean gestation period for the three cows is similar to the long-term average of 223 days. The data suggest the Heatwatch estrus detection system is an accurate and useful method of remotely monitoring breeding activity.

We recently collaborated with Dr. Dan Rule (University of Wyoming Department of Animal Science) and Dr. John Morton and Rick Ernst (KNWR) to collect samples from caribou hooves from MRC animals and from Killey River herd animals. Hoof trimming samples are being used to develop a baseline dataset of stable isotope signatures. Stable isotope signatures can potentially be used as indicators of nutritional state, changes in seasonal metabolic function, or changes in diet that reflect changing browse quality or

foraging ecology. These samples are currently being analyzed at the University of Wyoming.

OBJECTIVE 8: Preparation of Research Proposals, Reports, and Publications. Goals: To generate new research topics and proposals, report on work that is in progress or has been completed, and to publish manuscripts in peer-reviewed journals.

Progress: We completed both animal husbandry and research project specific animal care and use committee documents for the MRC. We also designed and wrote a three-year study plan and developed associated research methodology that will quantify the metabolic cost of pregnancy, develop an index of body condition usable by managers in the field, and identify remote indications of nutritional state.

II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD

JOB 1: MRC Operations.

In addition to routine animal husbandry and feeding operations necessary to maintain the health and safety of 23 captive adult moose and 17 captive adult caribou, 6 orphaned moose calves (4 female, 2 male) were brought to the MRC in June and July 2003 for bottle raising and human habituation. Milk intake and weight gain data was collected throughout nursing and weaning onto natural forage. These data are currently being summarized and compared to data obtained for moose calves raised at other facilities. We also continued to replace and repair damaged and fallen perimeter and interior fence. A section of approximately 1200 feet in the caribou handling pens was repaired as follows: Fallen or rotten spruce poles were replaced with steel drill stem posts, and old fencing was replaced with 8' high fixed knot woven wire purchased during 2002. In addition, work continued to replace metabolic stalls and renovate the barn and animal handling facility. Three concrete pours totaling 23 cubic yards of concrete were required to replace four holding stalls and install a concrete apron, and an in-floor heat system was installed to facilitate collection of urine and fecal samples during winter months. New steel gate panels were purchased to separate the stalls. A new steel roof was installed on the western half of the barn.

JOB 6: Moose Digestion, Reproduction, and Physiology

Some VHF radio or GPS/VHFc collars contain a mercury tip switch that records animal activity on a graded scale. However, this scale has never been validated with or correlated to actual observations of animal behavior and activity. MRC personnel collected 180 hours (540 total data points) of animal behavior and activity data on moose wearing these collars. Animals were classified as bedded, ruminating, feeding with head high, feeding with head low, standing, walking, or running. We are currently analyzing data and attempting to correlate moose behavior and activity with the amount of activity recorded by the collar. This validation study will be important in our future efforts to relate moose foraging behavior and effort to habitat type and plant community.

In collaboration with Dr. Dan Rule, Dr. Grant Hilderbrand, and Howard Golden, we analyzed 15 moose and 58 wolf adipose tissue samples using a gas chromatograph to determine fatty acid profile. We hypothesized that the fatty acids of wolf adipose tissue would reflect that of their prey because wolves are non-ruminants and would not modify dietary fatty acids. Thus, adipose tissue of wolves preying on moose should contain fatty acids characteristic of the moose. Indeed, wolf adipose tissue contained these fatty acids. This preliminary data set is currently being used to write a complete study proposal.

MRC personnel collaborated with Neil Barten (ADF&G Region I) on moose research in Gustavus, AK and with Matt Moran (USFS Chugach NF) in Yakutat, AK in November and December 2003. Ten adult bulls were captured and fitted with VHF radiocollars in Yakutat, and 8 adult cows were captured and collared in Gustavus. Ultrasound was used to measure rump fat levels indicative of total body fat, morphological measurements were made, and a body condition was assessed in these moose at the time of initial capture. Three of the female moose initially collared in Gustavus, and an additional 12 adult cows, were recaptured in spring 2004 and body fat and condition were again measured in order to relate levels of body fat to overall reproductive performance. In addition, blood and fecal samples were collected, and a tooth was removed from all moose at time of capture. Blood from female moose was used to assay for pregnancy-specific protein B (PSPB) to determine reproductive status while fecal samples from all animals were used to determine diet composition. Teeth were sectioned to determine animal age. There were no capture related mortalities on this project.

JOB 7: Caribou Digestion, Reproduction, and Physiology

In collaboration with Dr John Morton and Rick Ernst (KNWR Staff), and Jeff Selinger and Thomas McDonough (ADF&G Kenai Peninsula /GMU 7&15 Management biologists) we collected hoof samples from 14 Killey River Herd caribou killed in avalanches in December and January 2003–2004, and six live, short-yearling females from this herd that were captured and radiocollared during March 2004. One additional short-yearling female caribou was lost to hyperthermia as a result of this handling. During routine handling and vaccination operations in April 2004, we also collected hoof samples from 11 captive caribou at the MRC. These samples are currently being analyzed for nitrogen and carbon stable isotope signatures on an isotope-ratio mass spectrometer by Dr. Dan Rule, University of Wyoming, Department of Animal Science. This preliminary data set will be used as part of a complete study proposal investigating seasonal changes in caribou body condition and physiology.

JOB 8: Preparation of Research Proposals, Reports, and Publications

We completed both animal husbandry and research project specific animal care and use committee documents for the MRC. We also designed and wrote a three-year study plan and developed associated research methodology that will quantify the metabolic cost of pregnancy, develop an index of body condition usable by managers in the field, and identify remote indications of nutritional state. This project has been assigned project number 1.60 and work will begin fall 2004.

III. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

MRC personnel also traveled to Gustavus and in addition to assisting with capture operations there and quantifying body reserves and reproductive performance in moose in that area assessed the feasibility of monitoring and quantifying browse intake in wild moose foraging naturally in that area.

IV. PUBLICATIONS

Serosurvey for Antibodies against Salmonella species in free-ranging moose (*Alces alces*) from Norway. 2003. Ansgar Aschfalk, **Kris J. Hundertmark**, Heidi R. Bendiksen, Jon M. Arnemo, and Nicolai Densin. Berl. Munch.Tierartzl. Wsrchr. 116: 417-420.

V. RECOMMENDATIONS FOR THIS PROJECT

None

VI. APPENDIX

VII. PROJECT COSTS FOR THIS SEGMENT PERIOD

FEDERAL AID SHARE \$ _78,240___ STATE SHARE \$ _26,080___ = TOTAL \$ _104,320___

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